

FIGURE 1

BIT	FUNCTION	DESCRIPTION
15-0	PTI	PORT TAG INDEX.
19-16	EQoS	EGRESS QUEUE SELECT.
23-20	LAI	LAI INDEX.
24	JUMBO	EGRESS JUMBO CHECK FLAG.
25	DON'T FRAG	DON'T FRAGMENT FLAG.
26	IF TYPE	INGRESS INTERFACE TYPE. 0 = ETHERNET, 1 = POS INTERFACE.
27	-	RESERVED.
28	ROUTE	ROUTE FLAG.
29	RED	RANDOM EARLY DROP.
31-30	CTL	AFH FORMAT TYPE.
51-32	TXMI	TRANSMIT MODIFICATION INDEX.
58-52	CQoS	CPU QUEUE SELECT.
59	CPU COPY	CPU COPY FLAG.
60	REDIRECT	REDIRECT FLAG.
61	SSAMPLE	STATISTICAL SAMPLE FLAG.
62	LEARN	LEARN FLAG. REQUESTS OT TO SEND A COPY OF THE PACKET TO THE CPU FOR LEARN PROCESSING.
63	EMIRROR	EGRESS MIRROR.
75-64	IQoS	INGRESS QUEUE SELECT.
78-76	EMRK SEL	EGRESS MARK SELECT.
81-79	EMRK MASK	EGRESS MARK MASK.
82	IMIRROR	INGRESS MIRROR.
83	PERR KILL	PARITY ERROR KILL.

FIGURE 2

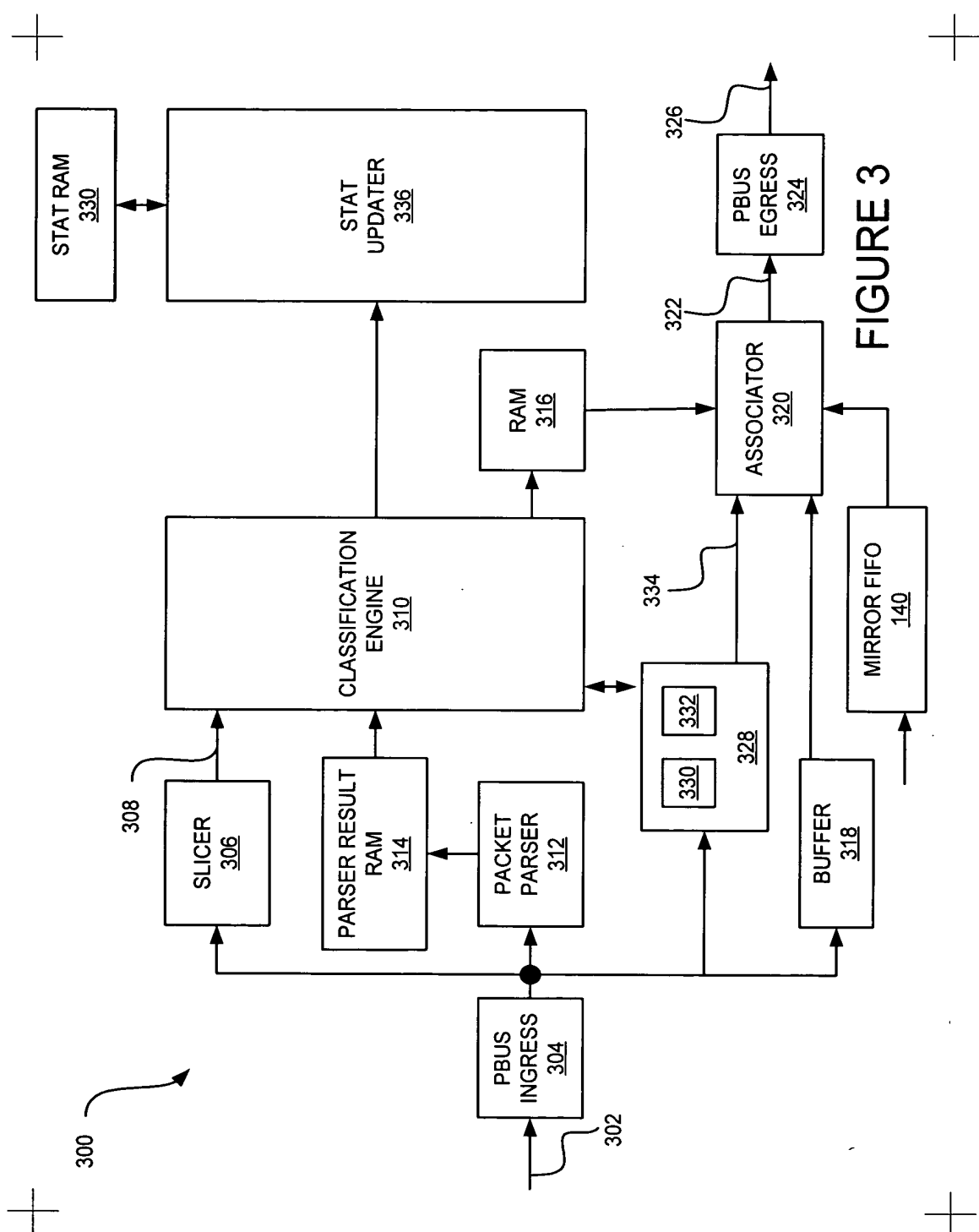


FIGURE 3

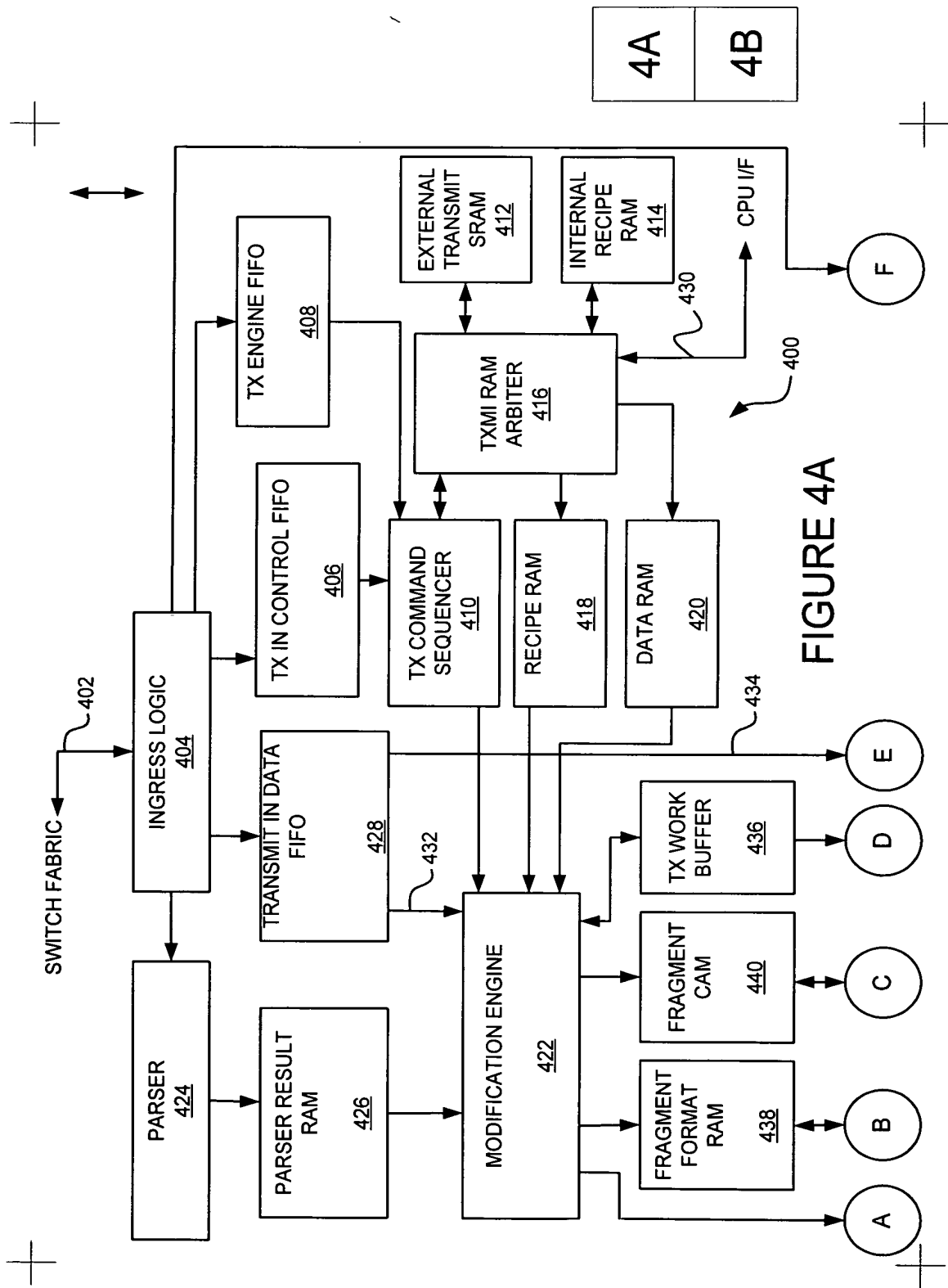


FIGURE 4A

4A	4B
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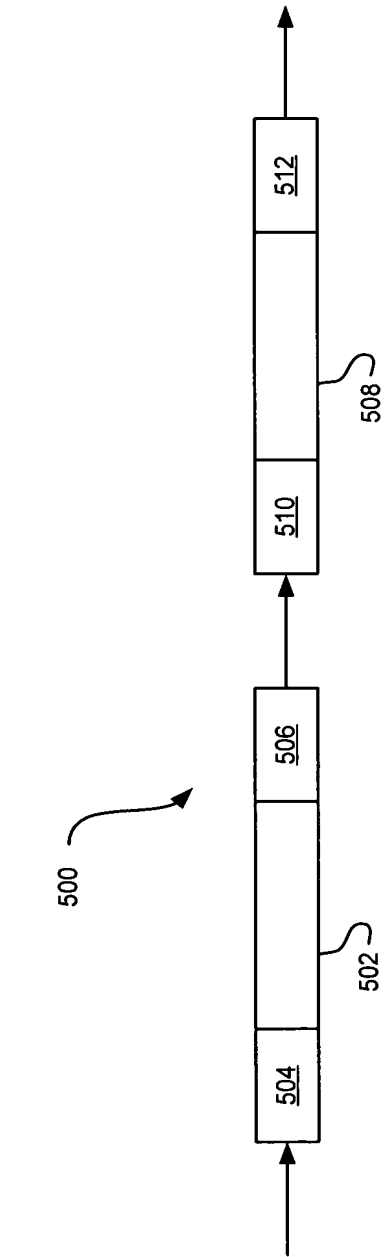


FIGURE 5

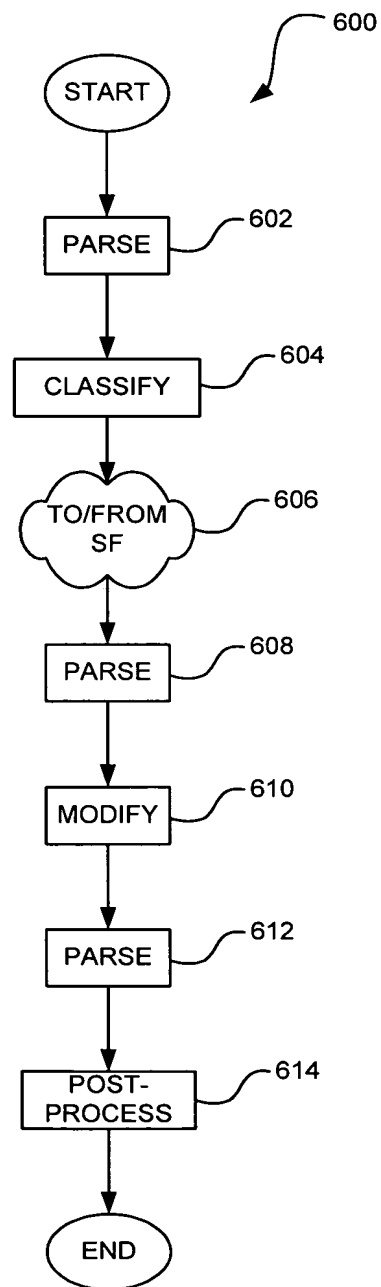


FIGURE 6

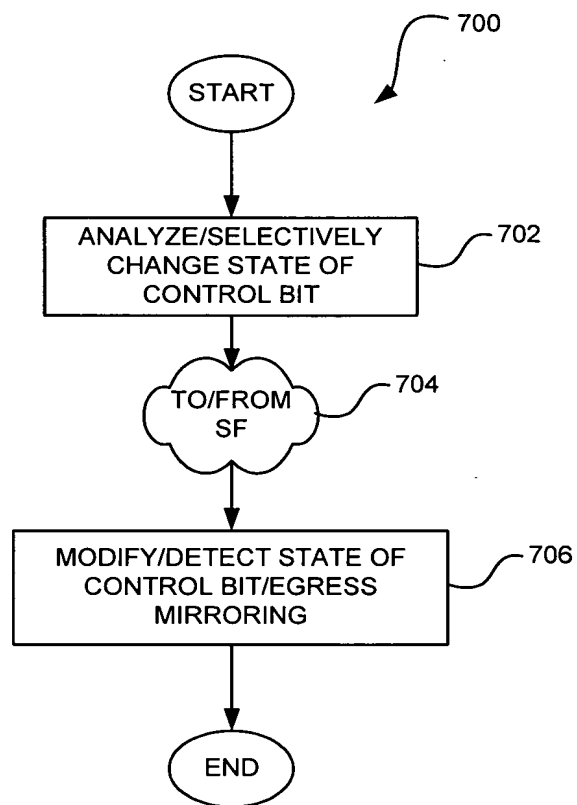


FIGURE 7



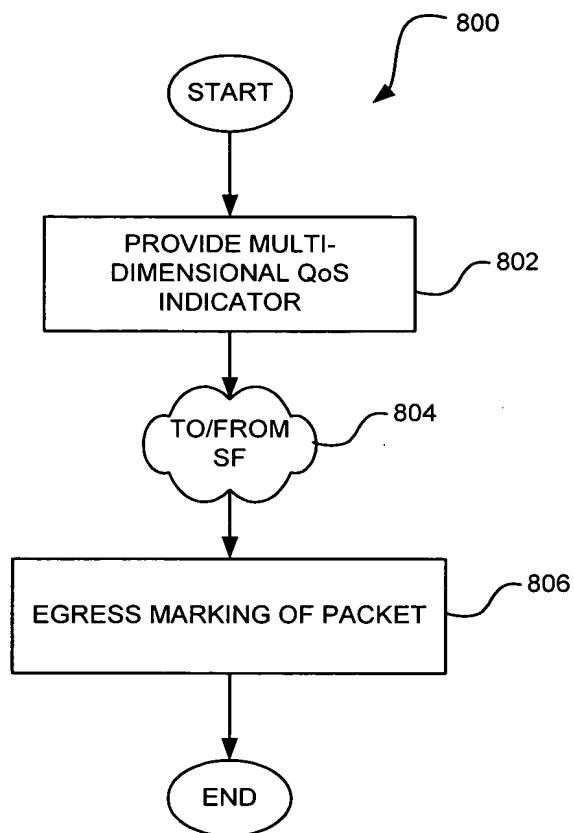


FIGURE 8

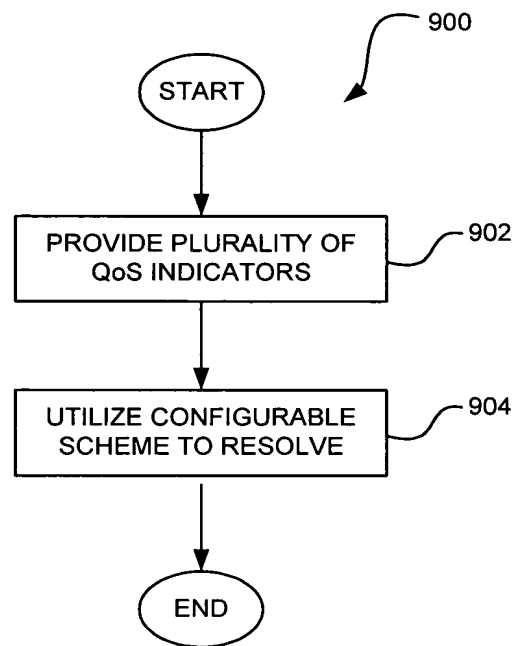


FIGURE 9

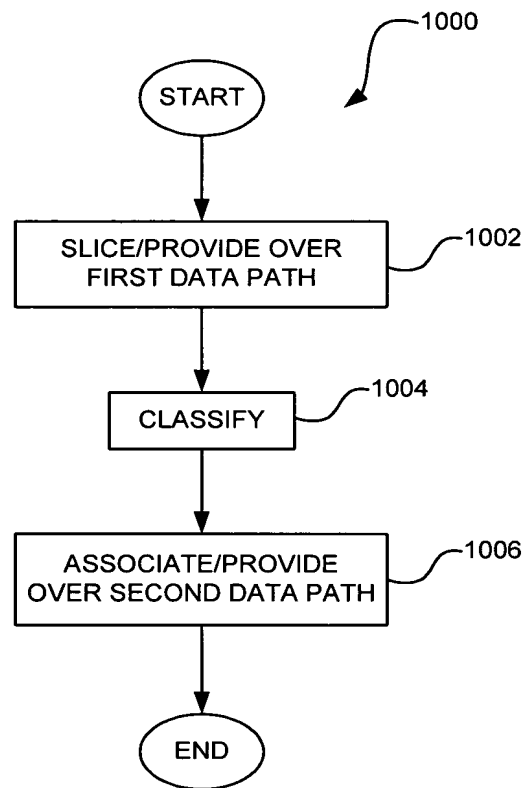


FIGURE 10

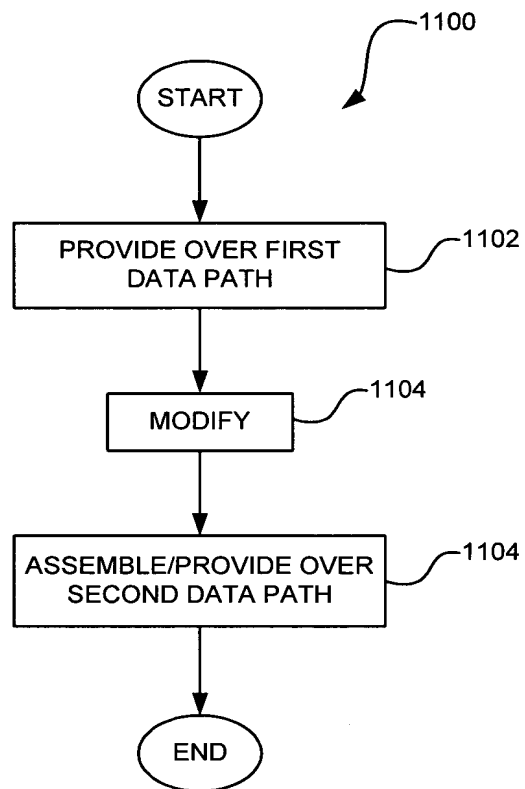


FIGURE 11

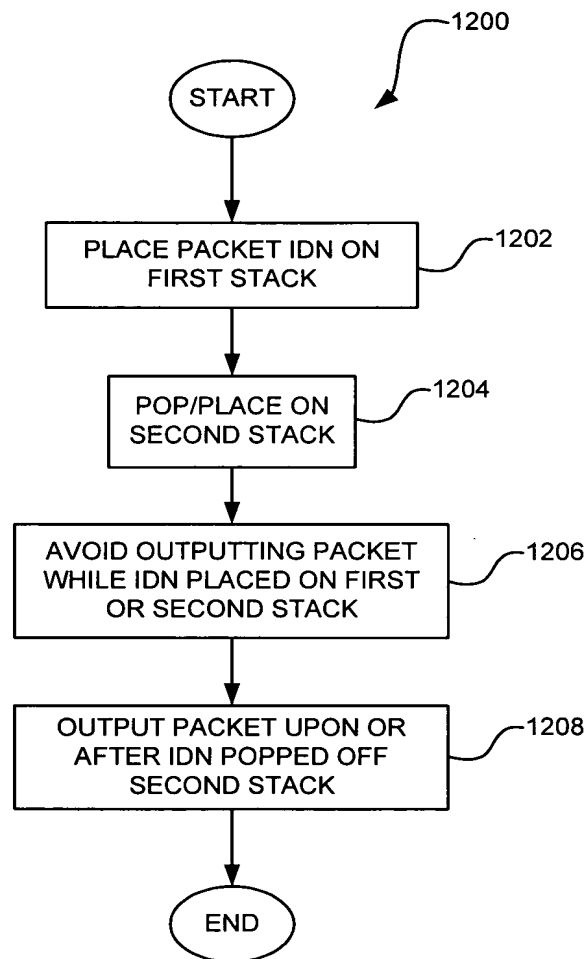


FIGURE 12

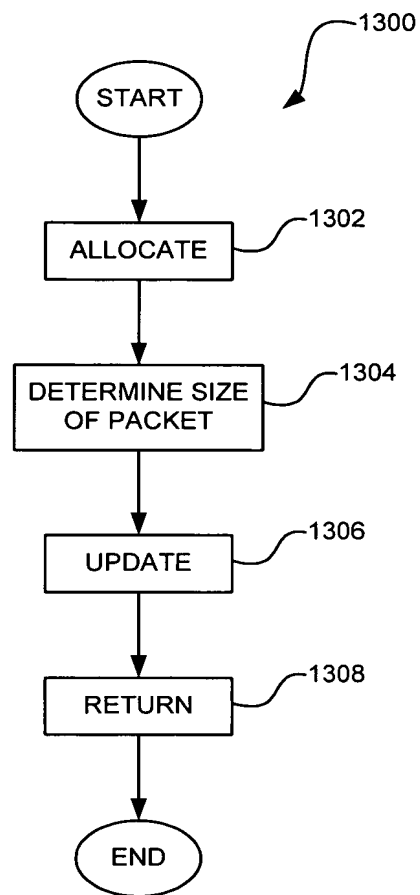


FIGURE 13

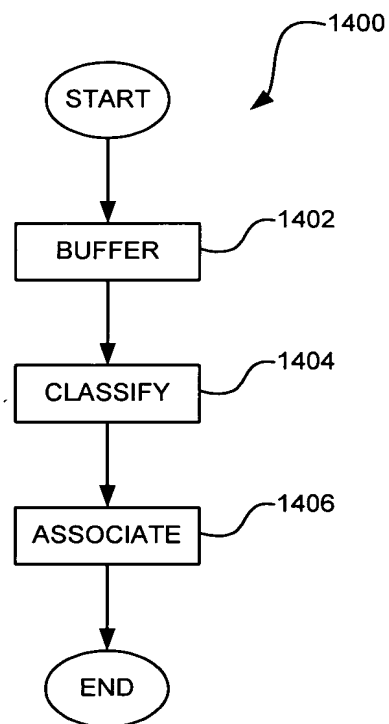


FIGURE 14

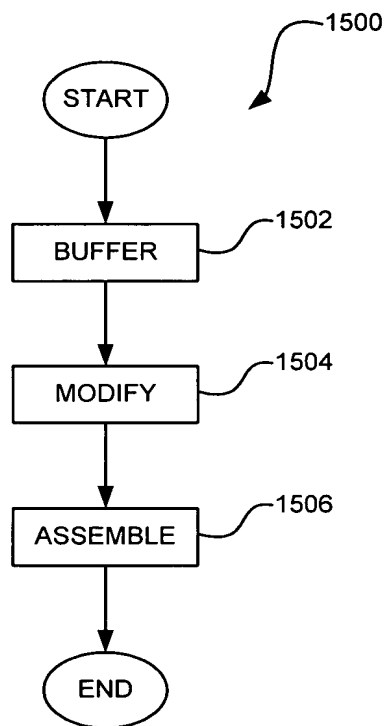


FIGURE 15



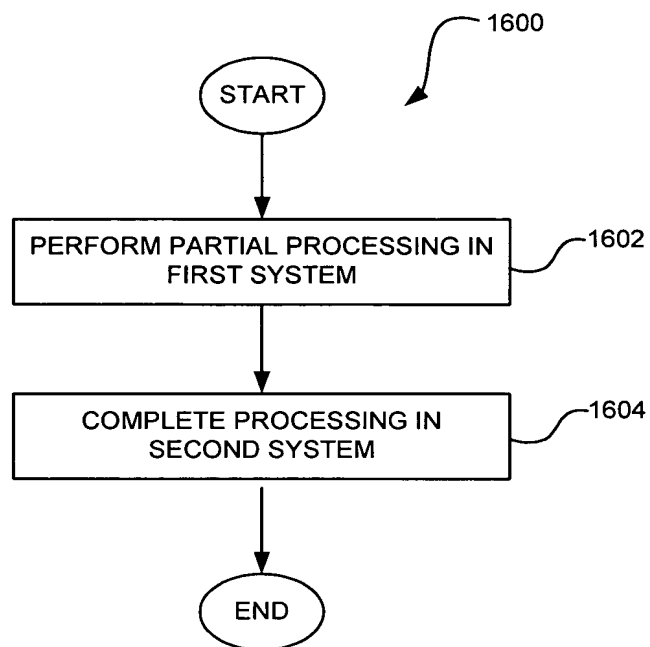


FIGURE 16

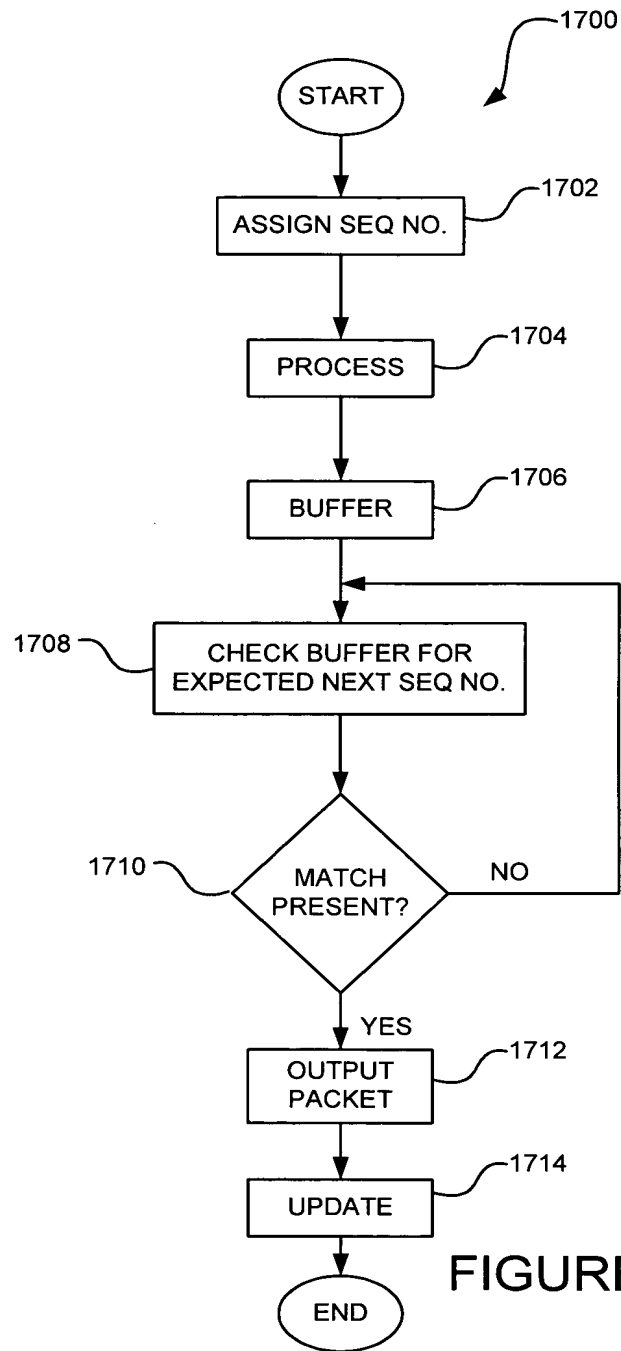


FIGURE 17

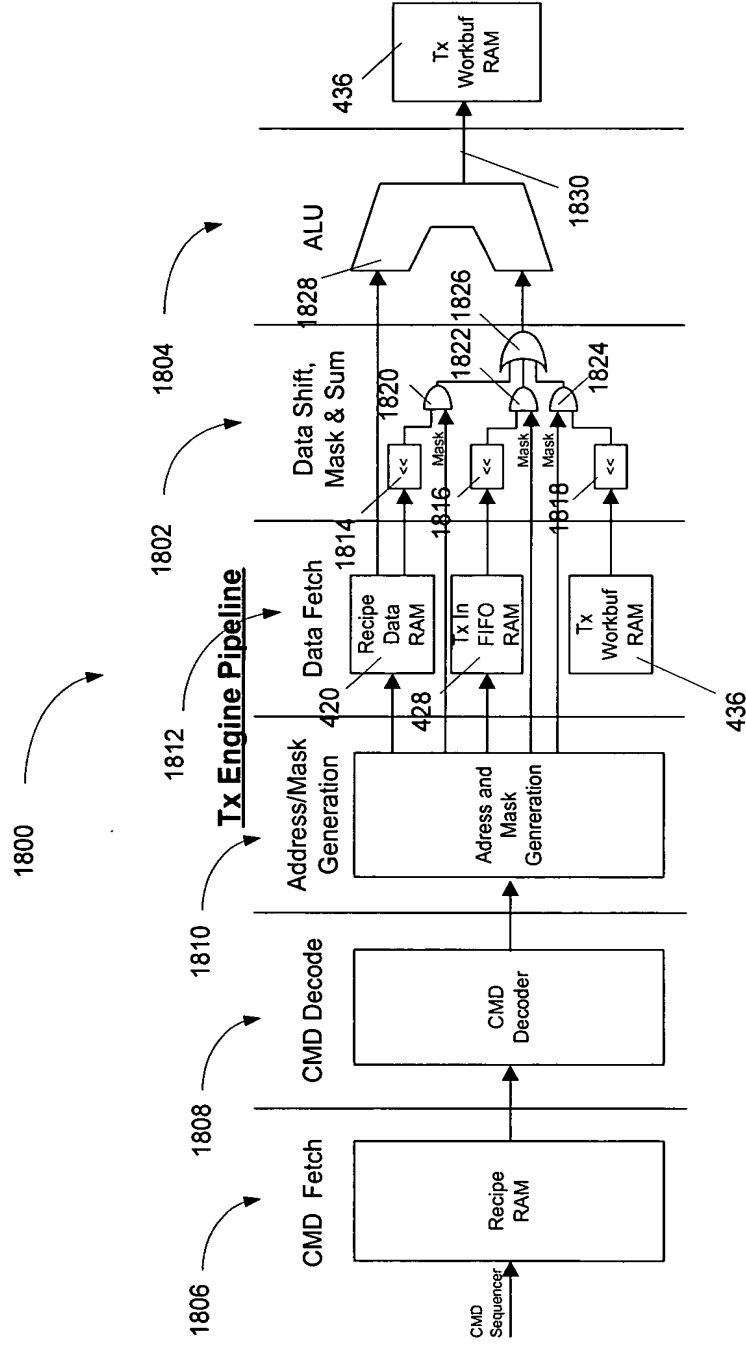


FIGURE 18

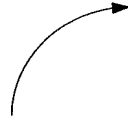
1900



10.4.1.1. External Link Entry Format

Bit	Function	Description
17-0	BURST ADDR 0	Burst Address 0.
21-18	BURST LEN 0	Burst Length 0.
41-22	BURST ADDR 1	Burst Address 1.
45-42	BURST LEN 1	Burst Length 1.
65-46	BURST ADDR 2	Burst Address 2.
69-66	BURST LEN 2	Burst Length 2.
70	INTEXT	Internal/External
71	PAR	Parity bit. Set so that there is odd parity across bits 71:0 of the entry data.

FIGURE 19

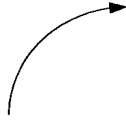


10.4.1.2. Internal Link Entry Format

Bit	Function	Description
20-0	BURST ADDR 1	Burst Address 1.
25-21	BURST LEN 1	Burst Length 1.
40-26	BURST ADDR 2	Burst Address 2.
51-47	BURST LEN 2	Burst Length 2.
62-52	INT RECIPE INDEX	Internal Recipe Index.
67-63	INT RECIPE LEN	Internal Recipe Length.
69-68	-	Reserved.
70	INT/EXT	Internal/External.
71	PAR	Parity Bit. Set so that there is odd parity across bits 71:30 of the entry data.

FIGURE 20

2100



10.4.1.4. Data Entry Format

Bit	Function	Description
31-0	DATA 0	Data Segment 0.
35-32	DATA LEN	Data Length.
63-36	DATA 1	Data Segment 1.
70-68	-	Reserved.
71	PAR	Parity Bit. Set so that there is odd parity across bits 0-70 of the entry data.

FIGURE 21A

TXM DataMask Format inside the external TXM RAM									
Parity[7]	Reserved[70:68]	Mask2 [67:60]	Data2 [59:44]	Data1 [43:36]	Length[30]	Mask0[31:16]	Data0[15:0]		
Parity[7]	Reserved[70:68]		Unused[67:36]		Length[30]	Unused[31:8]	Mask2[7:0]		

FIGURE 21B

Internal Header RAW Data Format				
[71]	[70]	[69:36]	[35:34]	[33:0]
Parity	Command (n+1) valid	Command (n+1)	Reserved	Command (n)

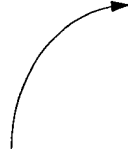
FIGURE 22



2300 

TXM Command Format									
[33:29]	[28]	[27:25]	[24:18]	[17]	[16:14]	[13:7]	[6]	[50]	
Opcode	Page	Con2	Offset2	Page	Con1	Offset1	Ins/Reg	Cmd Length	
		Source Address			Destination Address				

FIGURE 23



Context	Context Name	Location
C0	NULL	The very first byte of the packet including AFH
C1	L2	The start of the MAC header
C2	Ethertype	The start of the EtherType field (if present)
C3	MPLS	The start of the MPLS header(s) (if present)
C4	L3 Outer	The start of the outer L3 header
C5	L3 Inner	The start of the inner L3 header
C6	L4	The start of the TCP/UDP/? Header

FIGURE 24

Opcode	Command Mnemonic	Control Information	Data Fields
00000	TXM_CMD_NOP	-	-
00001	TXM_CMD_INSERT	Offset Length	Insertion Data
00010	TXM_CMD_DELETE	Offset Length	-
00011	TXM_CMD_REPLACE	Offset Length	Replacement Data
00100	TXM_CMD_REPLACE_MASK	Offset Length	Replacement Data/Mask
00101	TXM_CMD_COPY	Offset Source, Offset Destination, Length	-
00110	TXM_CMD_COPY_MASK	Offset Source, Offset Destination, Length	Copy Mask
00111	TXM_CMD_COPY_INS	Offset Source, Offset Destination, Length	-
01000	TXM_CMD_COPY_INS_MASK	Offset Source, Offset Destination, Length	Copy Mask
01001	TXM_CMD_MACRO1	Offset Destination, Length VDEL, MICAST flags, MAC DA, MAC SA, VLAN	MAC DA, MAC SA
01010	TXM_CMD_MACRO2	VDEL, MICAST flags, MAC DA, MAC SA, VLAN	MAC DA, MAC SA
01011-01100	RESERVED	-	-
01101	TXM_CMD_ACL	Index, VPORT	-
01110	TXM_CMD_ENIC VPRI	VPRI-EXP ENIC fields	-
01111	TXM_CMD_ENIC IPTOS	IPTOS ENIC fields	-
10000	TXM_CMD_INCREMENT_INSERT	Offset Length	-
10001	TXM_CMD_INCREMENT_REPLACE	Offset Length	-
10010	TXM_CMD_DECREMENT	Offset Length	-
10011	TXM_CMD_AND	Offset Length	ALU Data
10100	TXM_CMD_OR	Offset Length	ALU Data
10101	TXM_CMD_XOR	Offset Length	ALU Data
10110	TXM_CMD_ADD	Offset Length	ALU Data
10111	TXM_CMD_SUB	Offset Length	ALU Data
11000	TXM_TTL_DECREMENT	MCAST/BCAST flags	TTL decrement limit registers
11001	TXM_TC_INCREMENT	-	TC limit register
11010	TXM_TTL_DECREMENT_INS	MCAST/BCAST flags	TTL decrement limit registers
11011	TXM_TC_INCREMENT_INS	-	TC limit register
11100-11111	Reserved	-	-

FIGURE 25

	txmi_cmd_replace_da	(Context: L2, Offset: 0, Length 6)
	txmi_cmd_data	MAC DA (6 bytes external)
OPT1:	txmi_cmd_replace	(Context: L2, Offset: 6, Length 6)
	txmi_data	MAC SA (6 bytes external)
OPT2:	txmi_cmd_replace_sa	(Context: L2, Offset: 6, Length 6)
	txmi_data	Internal SA Pointer
OPT3:	txmi_cmd_vlan_delete_replace	(Context: L2, Offset: 14, Length 2)
	txmi_data	VLAN (2 bytes external)

- OPT1: If configuration register flag (use\_internal\_mac\_sa) is set to 0 then the MAC SA will be read from the external TXM RAM.
- OPT2: If configuration register flag (use\_internal\_mac\_sa) is set to 1 then the MAC SA data will come from the internal register in the source field of the command (0 – 15).
- OPT3: If the VDEL flag is set to 1 the VLAN field will be deleted else the VLAN field will be replaced with external TXM data.

FIGURE 26

OPT1:	txmi_cmd_replace_da	(Context: L2, Offset: 0, Length 6)
	txmi_cmd_data	MAC DA (6 bytes external)
	txmi_cmd_replace	(Context: L2, Offset: 6, Length 6)
	txmi_data	MAC SA (6 bytes external)
	txmi_cmd_replace_sa	(Context: L2, Offset: 6, Length 6)
OPT2:	txmi_data	Internal SA Pointer
OPT3:	txmi_cmd_vlan_delete	(Context: L2, Offset: 14, Length 2)
OPT1:	If configuration register flag (use_internal_mac_sa) is set to 0 then the MAC SA will be read from the external TXM RAM.	
OPT2:	If configuration register flag (use_internal_mac_sa) is set to 1 then the MAC SA data will come from the internal register in the source field of the command (0 – 15).	
OPT3:	If the VDEL flag is set to 1 the VLAN field will be deleted else the txmi_cmd_vlan_delete command will be converted to a txmi_cmd_nop command.	

FIGURE 27

```

if broadcast IP packets
    if (TTL>IPbroadcast_TTL_Limit(sub_channel))
        Decrement TTL
        continue with next operation
    else
        Drop the packet
else if multicast IP packets
    if (TTL>IPmulticast_TTL_Limit(sub_channel))
        Decrement TTL
        continue with next operation
    else
        Drop the packet
else // Must be unicast IP packets
    if (TTL>IPunicast_TTL_Limit(sub_channel))
        Decrement TTL
        continue with next operation
    else
        Drop the packet

```

FIGURE 28

```
if (TC<TC_Limit(sub_channel))  
    Increment TTL  
    continue with next operation  
else  
    Drop the packet
```

FIGURE 29

IXM Command Format for the 1x ACL block				
[33:29]	[28:20]	[19:4]	[3:0]	
Opcode	Reserved	VFORT		Index

FIGURE 30

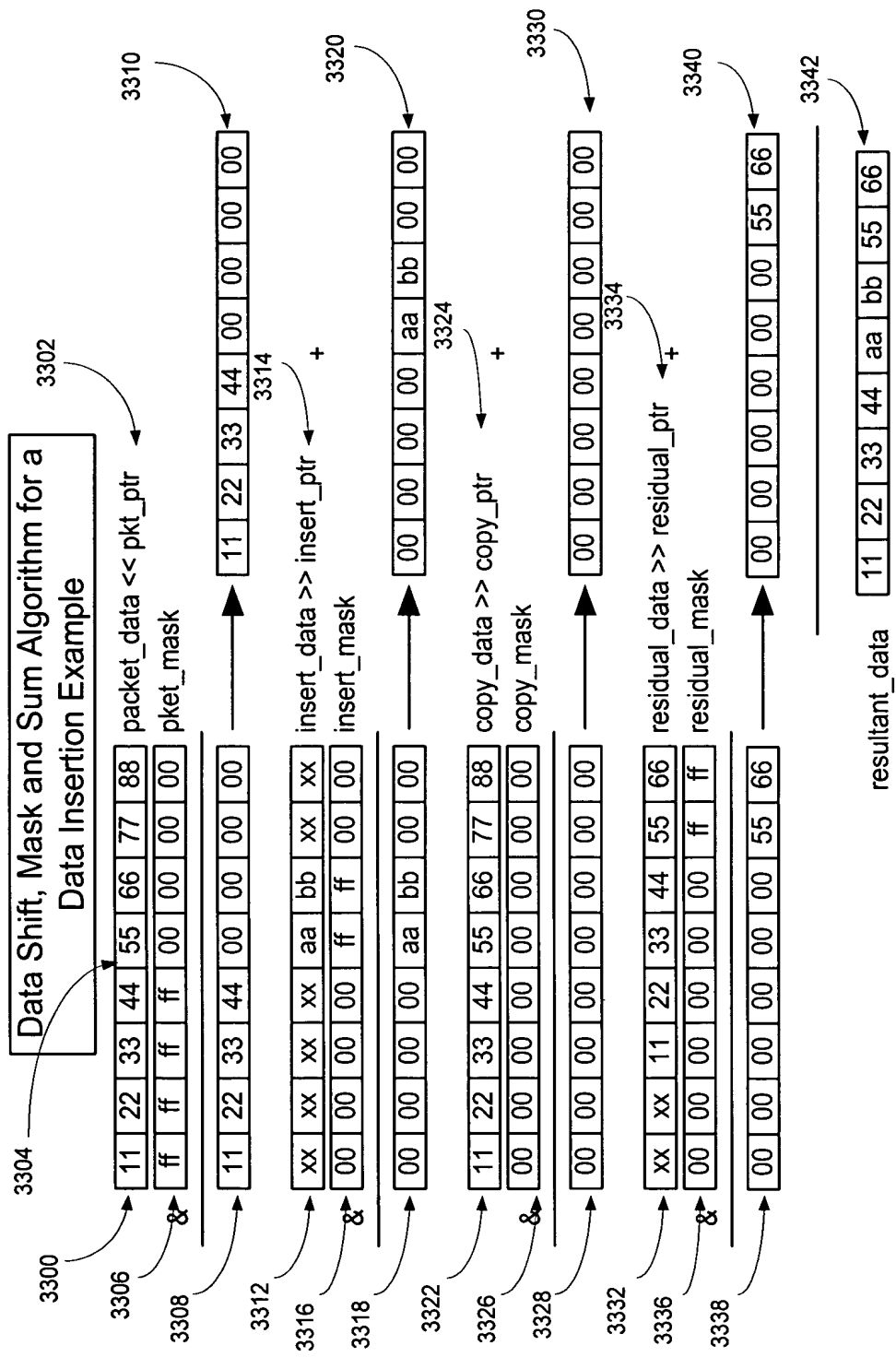


TXM Command Format for the TX Post Processor block		
1332h	1283h	170f
Opcode	VPRI-EXP / PTOS-EMC Command	Reserved

FIGURE 31

Error Flag	Error Description	Action
0	ALU & Copy commands > packet size	Flag packet to be killed
1	Destination address is ahead of current read pointer	Flag packet to be killed
2	ALU & Copy commands > packet size	Flag packet to be killed
3	Reserved Opcode detected in the pipeline	Flag packet to be killed
4	Context1 < Context10	Flag packet to be killed
6	Context2 < Context11	Flag packet to be killed
7	Context3 < Context12	Flag packet to be killed
8	Context4 < Context13	Flag Packet to be killed
9	Context5 < Context14	Flag packet to be killed
10	Context6 < Context15	Flag packet to be killed
11	TTL < limit or TC > limit	Flag packet to be killed
12	TXM_IN_DATA_RAM Parity Error	Flag packet to be killed
13	Tx Workbuf Parity Error	Flag packet to be killed
14	TRAM or Internal Recipe RAM Parity Error	Flag packet to be killed
15	Packet modification > 0x80	Flag packet to be killed

FIGURE 32



**FIGURE 33**

# Sample Transmit Modification Recipe for a MAC Header Operation

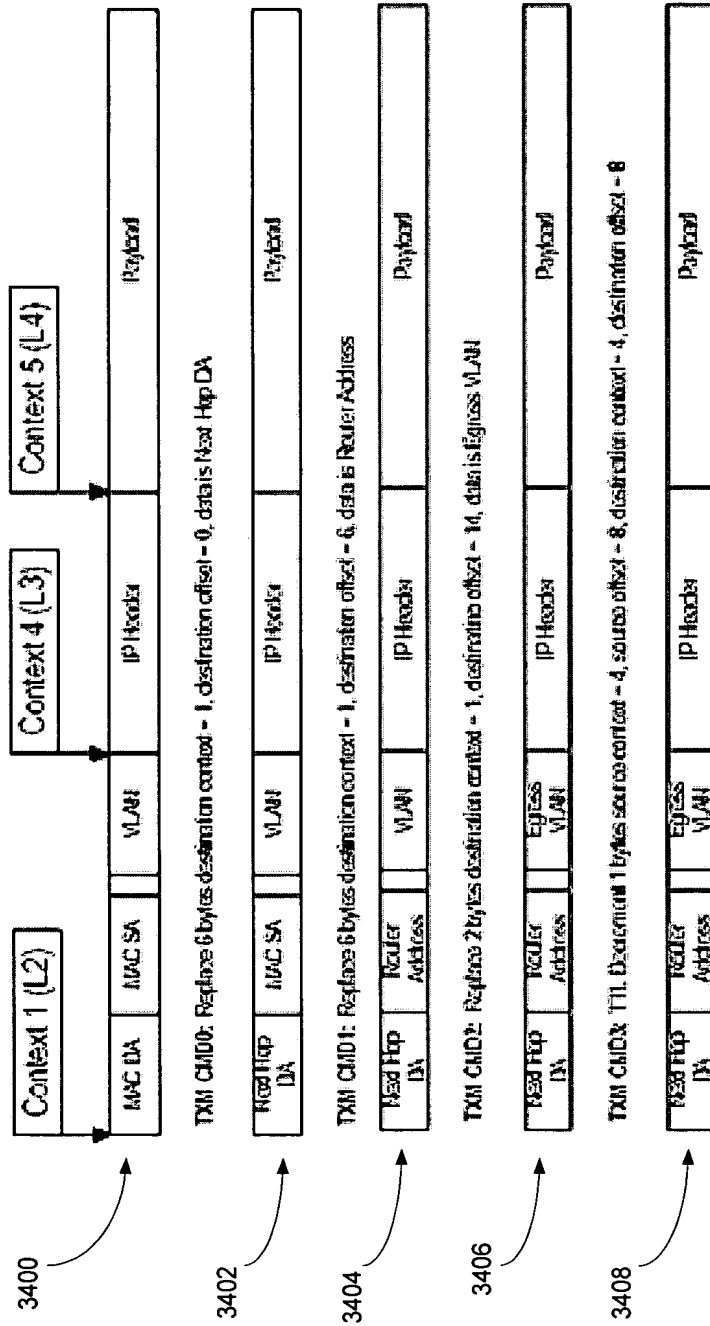


FIGURE 34

Forwarding Process Operation	Modification Type	Size (Bytes)	Packet Offset(s)
Next Hop MAC DA Replacement	Replace	6	0 (MAC)
Next Hop VLAN ID Replacement	Masked Replace	2	12 (MAC)
Source Address Insertion	Replace	6	6 (MAC)
TTL Decrement IPv4	Decrement	1	8 (NETWORK)
MPLS Stack Single Entry Add/Delete	Insert / Delete	4	0 (MPLS)
MPLS Stack Double Entry Add/Delete	Insert / Delete	8	0 (MPLS)
MPLS Label Change	Replace (could be masked to preserve CoS bits)	4	0 (MPLS)
MPLS TTL Decrement	Decrement	1	3 (MPLS)
MPLS TTL Copy	Copy	1	3 (MPLS) to 8 (NETWORK)
MPLS EtherType Replace/Restore	Replace	2	0 (L.L.C)
IP v4 Encapsulate/De-Encapsulate	Insert / Delete	20	0 (NETWORK)

FIGURE 35

<b>CMD Function</b>	<b>CMD #</b>	<b>TXM CMD MNEUMONIC</b>	<b>Source Context</b>	<b>Source Offset</b>	<b>Destination Context</b>	<b>Destination Offset</b>	<b>Length</b>
Replace MAC DA	1	TXM_CMD_REPLACE	--	--	L2	0	6
		TXM_CMD_DATA	--	--	--	--	6
Replace MAC SA	2	TXM_CMD_REPLACE	--	--	L2	6	6
		TXM_CMD_DATA	--	--	--	--	6
Replace VLAN ID	3	TXM_CMD_REPLACE	--	--	L2	14 (no DID)	2
		TXM_CMD_DATA	--	--	--	--	2
Decrement IPv4 TTL	4	TXM_CMD_DECREMENT	L3	8	L3	8	1

FIGURE 36

CMD Function	CMD #	TXM CMD MNEUMONIC	Source Context	Source Offset	Destination Context	Destination Offset	Length
Replace MAC DA	1	TXM_CMD_REPLACE	--	--	L2	0	6
		TXM_CMD_DATA	--	--	--	--	6
Replace MAC SA	2	TXM_CMD_REPLACE	--	--	L2	6	6
		TXM_CMD_DATA	--	--	--	--	6
Replace VLAN ID	3	TXM_CMD_REPLACE	--	--	L2	14	2
		TXM_CMD_DATA	--	--	--	--	2
IPv4 Encap	4	TXM_CMD_INSERT	--	--	L3 Outer	0	7
		TXM_CMD_DATA	--	--	--	--	7
TTL Decrement	5	TXM_CMD_DECREMENT INSERT	L3 Outer	8	L3 Outer	0	1
IPv4 Encap	6	TXM_CMD_INSERT	--	--	L3 Outer	0	8
		TXM_CMD_DATA	--	--	--	--	8
IPv4 Encap	7	TXM_CMD_INSERT	--	--	L3 Outer	0	4
		TXM_CMD_DATA	--	--	--	--	4

FIGURE 37

<b>CMD Function</b>	<b>CMD #</b>	<b>TXM CMD MNEUMONIC</b>	<b>Source Context</b>	<b>Source Offset</b>	<b>Destination Context</b>	<b>Destination Offset</b>	<b>Length</b>
Replace MAC DA	1	TXM_CMD_REPLACE	-	--	L2	0	6
		TXM_CMD_DATA	-	--	--	-	6
Replace MAC SA	2	TXM_CMD_REPLACE	-	--	L2	6	6
		TXM_CMD_DATA	-	--	--	-	6
Replace VLAN ID	3	TXM_CMD_REPLACE	-	--	L2	14 (no DID)	2
		TXM_CMD_DATA	-	--	--	-	2
IPV4 de- encapsulate	4	TXM_CMD_DELETE	-	--	L3 Outer	0	0
Decrement Inner TTL	5	TXM_TTL_DECREMENT	L3 Inner	8	L3 Inner	8	1

**FIGURE 38**



CMD Function	CMD #	TXM CMD MNEUMONIC	Source Context	Source Offset	Destination Context	Destination Offset	Length
Replace MAC DA	1	TXM_CMD_REPLACE	--	--	L2	0	6
		TXM_CMD_DATA	--	--	--	--	6
Replace MAC SA	2	TXM_CMD_REPLACE	--	--	L2	6	6
		TXM_CMD_DATA	--	--	--	--	6
Replace VLAN ID	3	TXM_CMD_REPLACE	--	--	L2	14	2
		TXM_CMD_DATA	--	--	--	--	2
Ipv6 Encap	4	TXM_CMD_INSERT	--	--	L3 Outer	0	7
		TXM_CMD_DATA	--	--	--	--	7
TTL Decrement	5	TXM_CMD_DECREMENT	L3	8	L3 Outer	0	1
		INSERT	Outer	--	--	--	--
Ipv6 Encap	6	TXM_CMD_INSERT	--	--	L3 Outer	0	8
		TXM_CMD_DATA	--	--	--	--	8
Ipv6 Encap	7	TXM_CMD_INSERT	--	--	L3 Outer	0	8
		TXM_CMD_DATA	--	--	--	--	8
Ipv6 Encap	8	TXM_CMD_INSERT	--	--	L3 Outer	0	8
		TXM_CMD_DATA	--	--	--	--	8
Ipv6 Encap	9	TXM_CMD_INSERT	--	--	L3 Outer	0	8
		TXM_CMD_DATA	--	--	--	--	8

FIGURE 39

CMD Function	CMD #	TXM CMD MNEUMONIC	Source Context	Source Offset	Destination Context	Destination Offset	Length
Replace MAC DA	1	TXM_CMD_REPLACE	--	--	L2	0	6
		TXM_CMD_DATA	--	--	--	--	6
Replace MAC SA	2	TXM_CMD_REPLACE	--	--	L2	6	6
		TXM_CMD_DATA	--	--	--	--	6
Replace VLAN ID	3	TXM_CMD_REPLACE	--	--	L2	14	2
		TXM_CMD_DATA	--	--	--	--	2
IPv6 Encap	4	TXM_CMD_INSERT	--	--	L3 Outer	0	7
		TXM_CMD_DATA	--	--	--	--	7
		TXM_CMD_DECREMENT	L3 Outer	8	L3 Outer	0	1
IPv6 Encap	6	TXM_CMD_INSERT	--	--	L3 Outer	0	8
		TXM_CMD_DATA	--	--	--	--	8
IPv6 Encap	7	TXM_CMD_INSERT	--	--	L3 Outer	0	8
		TXM_CMD_DATA	--	--	--	--	8
IPv6 Encap	8	TXM_CMD_INSERT	--	--	L3 Outer	0	8
		TXM_CMD_DATA	--	--	--	--	8
IPv6 Encap	9	TXM_CMD_INSERT	--	--	L3 Outer	0	8
		TXM_CMD_DATA	--	--	--	--	8

FIGURE 40

CMD Function	CMD #	TXMI_CMD MNEUMONIC	Source Context	Source Offset	Destination Context	Destination Offset	Length
Last Hop Route Address	1	TXMI_CMD_COPY	L3	10	L2	0	6
Replace MAC SA	2	TXMI_CMD_REPLACE	--	--	L2	6	6
		TXMI_CMD_DATA	--	--	-	-	6
Replace VLAN ID	3	TXMI_CMD_REPLACE	--	--	L2	14	2
		TXMI_CMD_DATA	--	--	-	-	2
Increment TC	4	TXMI_CMD_INCREMENT	L3	5	L3	5	1

FIGURE 41

<b>CMD Function</b>	<b>CMD #</b>	<b>TXM CMD MNEUMONIC</b>	<b>Source Context</b>	<b>Source Offset</b>	<b>Destination Context</b>	<b>Destination Offset</b>	<b>Length</b>
Replace MAC DA	1	TXM_CMD_REPLACE	--	--	L2	0	6
		TXM_CMD_DATA	--	--	-	-	6
Replace MAC SA	2	TXM_CMD_REPLACE	--	--	L2	6	6
		TXM_CMD_DATA	--	--	-	-	6
Replace VLAN ID	3	TXM_CMD_REPLACE	--	--	L2	14	2
		TXM_CMD_DATA	--	--	-	-	2
Replace EtherType	4	TXM_CMD_REPLACE	--	--	Ether	0	2
MPLS Label Insert	5	TXM_CMD_INSERT	--	--	MPLS	0	3
		TXM_CMD_DATA	--	--	-	-	3
TTL Decrement	6	TXM_CMD_DECREMENT	L3	8	MPLS	3	1

FIGURE 42

CMD Function	CMD #	TXM CMD NAME/UNIONIC	Source Context	Source Offset	Destination Context	Destination Offset	Length
Replace MAC DA	1	TXM_CMD_REPLACE	--	--	L2	0	6
		TXM_CMD_DATA	--	--	-	-	6
Replace MAC SA	2	TXM_CMD_REPLACE	--	--	L2	6	6
		TXM_CMD_DATA	--	--	-	-	6
Replace VLAN ID	3	TXM_CMD_REPLACE	--	--	L2	14	2
		TXM_CMD_DATA	--	--	-	-	2
Replace EtherType	4	TXM_CMD_REPLACE	--	--	Ether	0	2
MPLS Label Insert	5	TXM_CMD_INSERT	--	--	MPLS	0	3
		TXM_CMD_DATA	--	--	-	-	3
TTL Decrement	6	TXM_CMD_DECREMENT	L3	8	MPLS	3	1
MPLS Label Insert	7	TXM_CMD_INSERT	--	--	MPLS	4	3
TTL Decrement	8	TXM_CMD_DECREMENT	L3	8	MPLS	7	1

FIGURE 43

<b>CMD Function</b>	<b>CMD #</b>	<b>TXM CMD MNEUNIONIC</b>	<b>Source Context</b>	<b>Source Offset</b>	<b>Destination Context</b>	<b>Destination Offset</b>	<b>Length</b>
Replace MAC DA	1	TXM_CMD_REPLACE	--	--	L2	0	6
		TXM_CMD_DATA	--	--	-	-	6
Replace MAC SA	2	TXM_CMD_REPLACE	--	--	L2	6	6
		TXM_CMD_DATA	--	--	-	-	6
Replace VLAN ID	3	TXM_CMD_REPLACE	--	--	L2	14	2
		TXM_CMD_DATA	--	--	-	-	2
MPLS Label Insert	4	TXM_CMD_INSERT	--	--	MPLS	0	3
		TXM_CMD_DATA	--	--	-	-	3
TTL Decrement	5	TXM_CMD_DECREMENT	L3	8	MPLS	3	1

FIGURE 44

<b>CMD Function</b>	<b>CMD #</b>	<b>TXM CMD MNEUMONIC</b>	<b>Source Context</b>	<b>Source Offset</b>	<b>Destination Context</b>	<b>Destination Offset</b>	<b>Length</b>
Replace MAC DA	1	TXM_CMD_REPLACE	--	--	L2	0	6
		TXM_CMD_DATA	--	--	-	-	6
Replace MAC SA	2	TXM_CMD_REPLACE	--	--	L2	6	6
		TXM_CMD_DATA	--	--	-	-	6
Replace VLAN ID	3	TXM_CMD_REPLACE	--	--	L2	14	2
		TXM_CMD_DATA	--	--	-	-	2
TTL Decrement	4	TXM_CMD_DECREMENT	L3	8	L3	8	1
Replace IP DA or SA	5	TXM_CMD_REPLACE	L3	12/16	L3	12/16	4
		TXM_CMD_DATA	--	--	-	-	4
Replace TCP/UDP Source or Dest port	5	TXM_CMD_REPLACE	L4	0/2	L4	0/2	2
		TXM_CMD_DATA	--	--	-	-	2

FIGURE 45

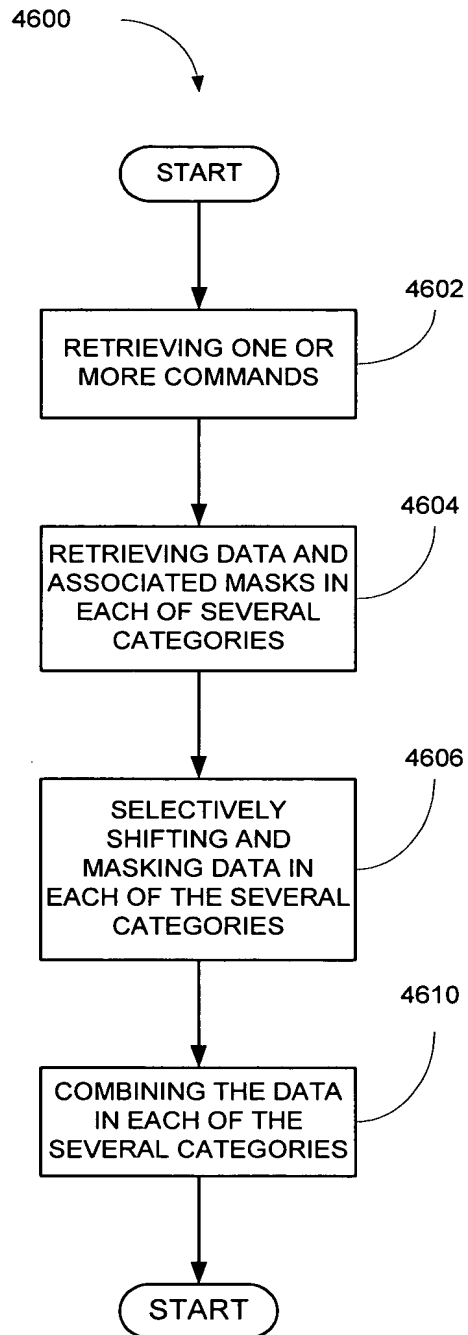


FIGURE 46



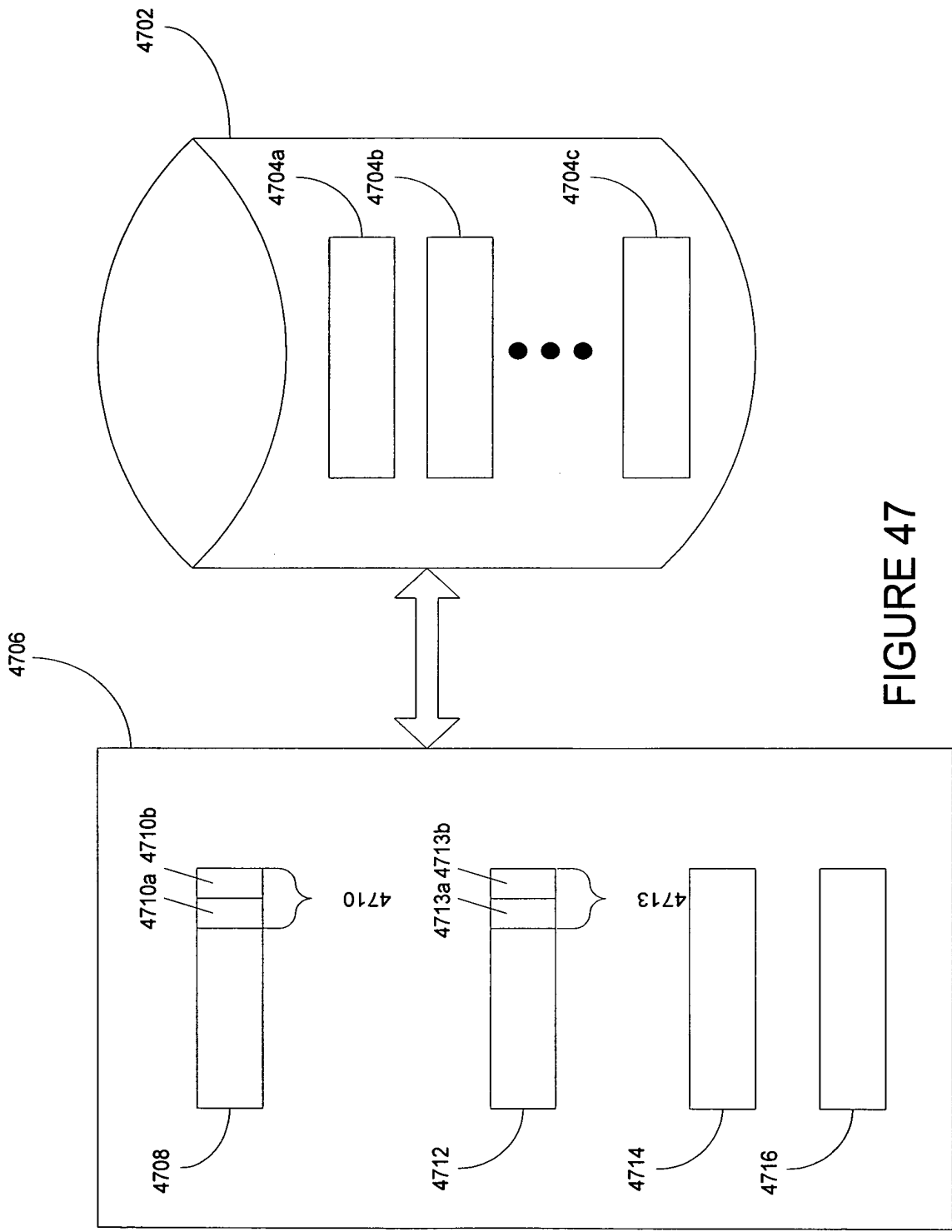


FIGURE 47

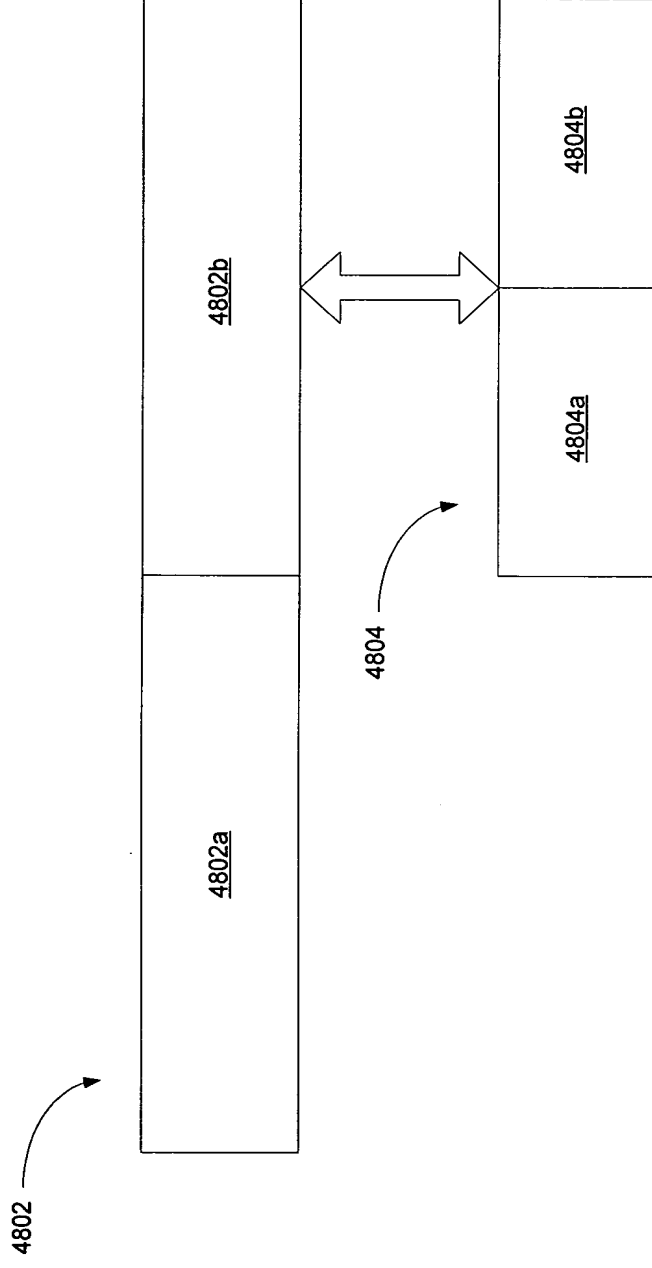


FIGURE 48